The right technology mix for Industry 4.0

Make your industrial campus work as one

NOKIA

Simplifying Industry 4.0 digitalization requirements

The fourth industrial revolution is under way. Enterprises across all industries are looking for ways to embrace data-driven operations, adopt zero-touch automation and transform the way people and machines work together. Their goal is to digitalize their operations to make production processes safer, more productive and more sustainable.

Connectivity is the key to achieving this goal. But the wireless networks at most industrial sites weren't designed to connect all industrial devices or transform data into insight. They also can't interface with legacy environments and enable mission-critical processes that demand pervasive broadband coverage, strong security, 24/7 availability and deterministic performance.

The path to transformation is complicated by the need to navigate a fragmented landscape of application, industrial device, connectivity and edge computing suppliers. This can lead to longer integration times, higher costs and an unpredictable return on investment.

Nokia makes digital transformation simpler and faster with one digital platform that provides multi-technology connectivity, Industrial Edge, applications and devices.

Our platform brings you:

- Industrial-grade private LTE/4.9G or 5G connectivity that can help you digitalize your operational technology (OT) systems to make them infinitely more agile and resilient
- A complementary Wi-Fi layer that provides connectivity for IT systems and non-business-critical OT use cases
- Certified industrial devices that help improve worker communication, productivity and safety
- An on-premises edge that can support and unify your industrial OT use cases and processes
- An application ecosystem that cuts through complexity and helps accelerate your digital transformation

With this unified platform, you get a complete private wireless connectivity infrastructure that can meet the security, reliability and performance demands of your machines, people and processes. This infrastructure can provide the deep data insights you need to support more agile and proactive operations and achieve your Industry 4.0 ambitions today and tomorrow.

Simplifying Industry 4.0 digitalization requirements

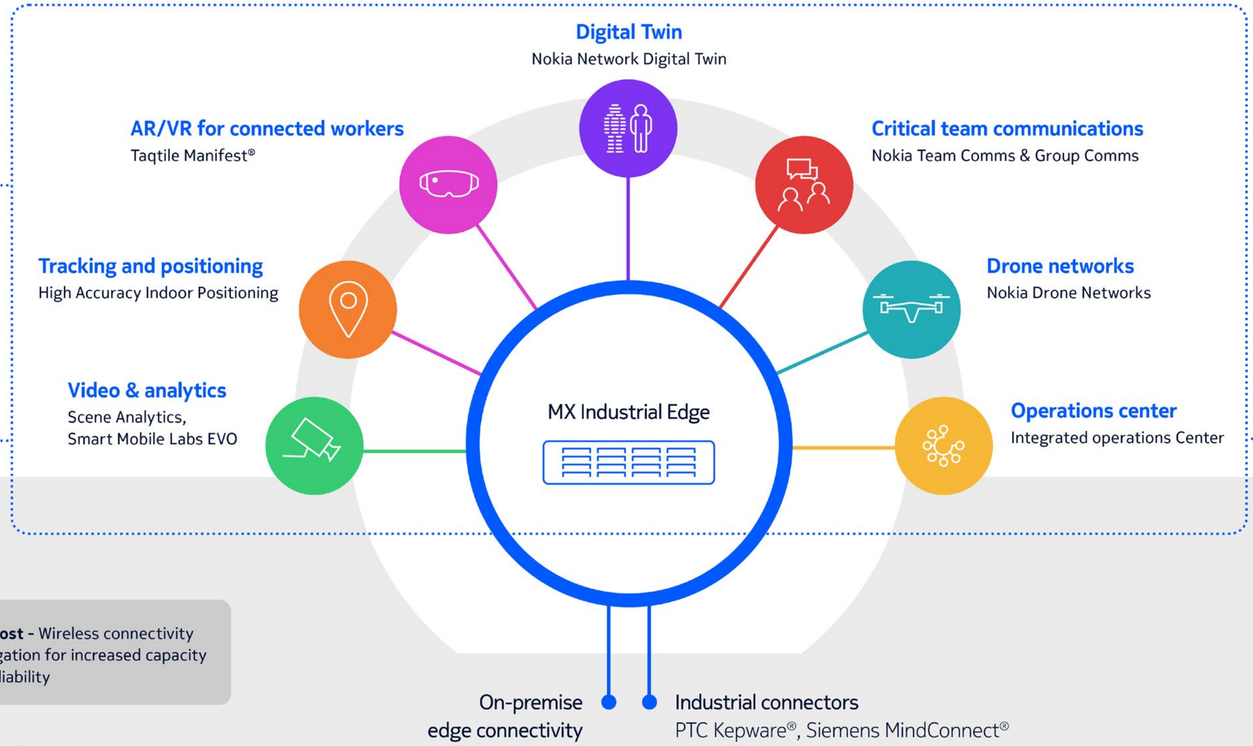
One platform for mission-critical Private Wireless and Industrial Edge

Deploy directly from the Nokia app catalog

Choose from a continuously growing app portfolio from Nokia and a wide ecosystem of best-in-class partners

Powered by Nokia MX Industrial Edge

Mission critical availability, low latency performance & OT data stays local with on-premise Industrial Edge for increased security



As a service model

Cloud-based management

Digital Automation Cloud enables seamless deployment, updates and maintenance from one central location

Private Wireless connectivity

4.9G | 5G | Wi-Fi

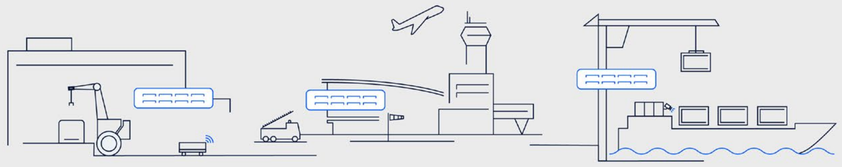
MX Boost - Wireless connectivity aggregation for increased capacity and reliability

For all assets using industrial devices

AR/VR | Handhelds / smartphones | Workpads | Cameras | Routers / Hotspots | Dongles & Trackers

For every industry, at any scale

- Manufacturing
- Logistics
- Airports, harbors
- Mining
- Energy
- Public saftey



Purpose-built networks for Industry 4.0 and beyond

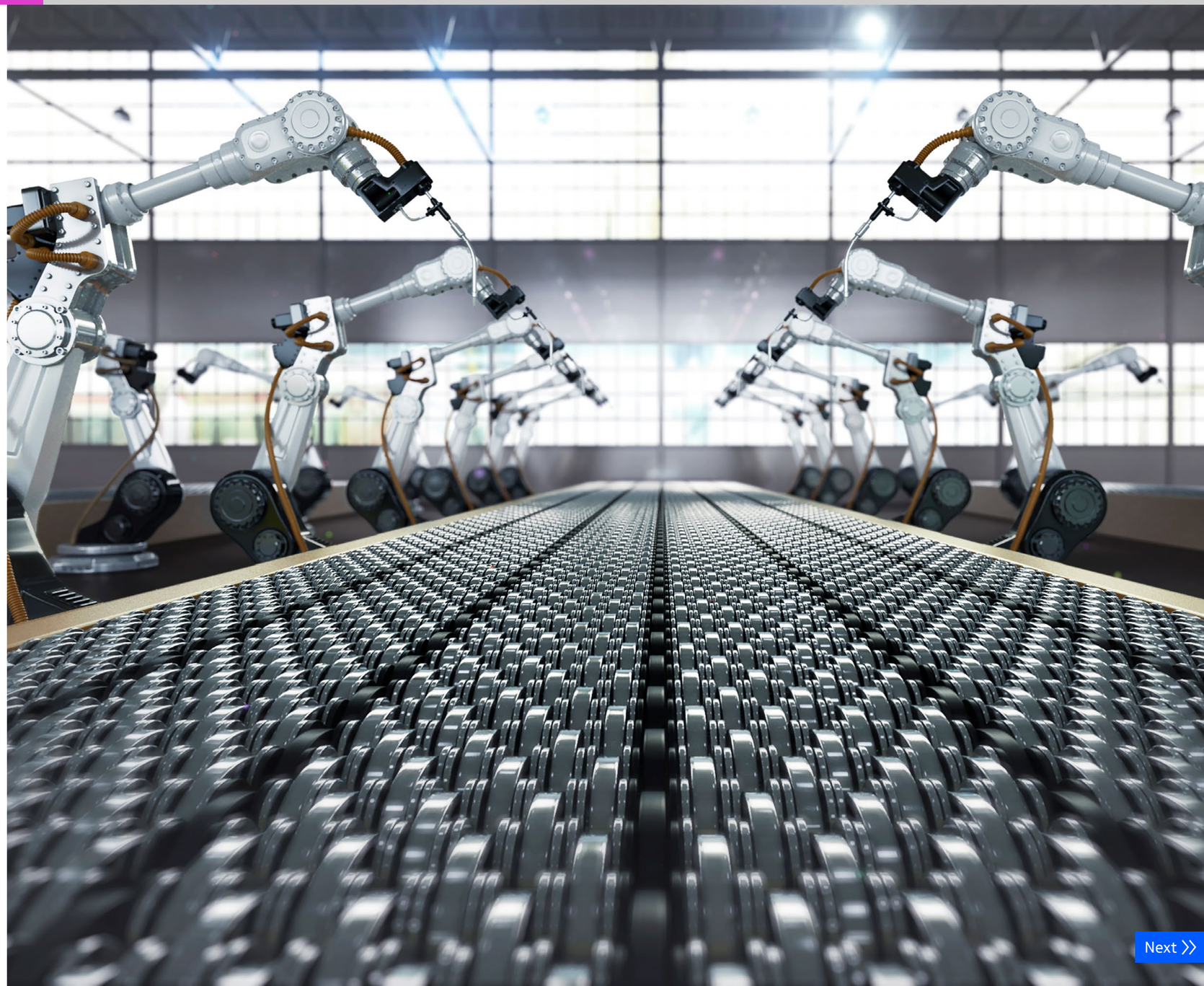
Nokia provides end-to-end industrial wireless campus solutions support essential use cases for hundreds of enterprises across a broad range of segments. These solutions help our customers connect all their assets, turn data into operational insight, maintain operational continuity and reap all the benefits of digitalization.

Read on to discover insights, use cases and case studies that show how our purpose-built networking solutions are helping companies in four industry segments lead the way with Industry 4.0.

Manufacturing and logistics

Manufacturing and logistics companies want to use digitalization and automation to accelerate their Industry 4.0 initiatives. To transform their operational processes, they need to connect their assets and generate insights from data while supporting 24/7 operations.

The key to success is to combine pervasive, reliable connectivity with edge computing, digital applications and industrial devices to meet the demands of everything from sensors and machines to robots and connected workers.



Opportunity and market fact – Manufacturing and logistics

Digital factories and supply chains need to work as one

Industry 4.0 presents a host of exciting possibilities to the manufacturing and logistics sector, from digital twins and autonomous mobile robots (AMRs) to remote maintenance and rich group communications. These use cases promise to reduce time to market, make production lines more flexible, optimize efficiency and bring the vision of zero safety issues within reach.

To turn these promises into operational realities, you need a platform that can:

- Connect your end-to-end production processes in real time
- Support edge computing applications while protecting your industrial data
- Provide high performance, reliability and security so you can digitalize your mission-critical control and communications applications
- Transform data into operational insight and support autonomous actions
- Ease your digital transformation and avoid disrupting your operations

This platform needs to be easy to set up and integrate with your legacy networks and OT. It must also work seamlessly with the Wi-Fi networks you rely on for basic IT connectivity.

Share of world's private sector GDP contributed by physical industries:

70% [1]

Percentage of manufacturers that are thinking about using 4G or 5G networks to support their operations:

>90% [2]

Forecasted compound annual growth rate of the warehouse automation market from 2022 to 2027:

15% [3]

Percentage of manufacturers that plan to upgrade their networks in the near term to advance digitalization and industry 4.0:

74% [4]

Solution – Manufacturing and logistics

Complete connectivity solutions for smart factories and supply chains

Nokia helps manufacturing and logistics companies unleash the value of Industry 4.0 with one digital platform that includes industrial-grade connectivity, edge computing, devices and applications.

This unified platform enables people and machines to work together in a safe, efficient and sustainable way.

Industrial-grade connectivity

Our private 4.9G/LTE and 5G solutions deliver pervasive, flexible mission-critical connectivity that makes it easy to reconfigure production lines or logistics flows as demands change. They let you combine low latency with high performance, resiliency, security and mobility to support any use case.

Nokia Digital Automation Cloud (DAC) lets you complement private wireless with Wi-Fi 6/6E to meet the connectivity demands of non-business-critical use cases such as asset tracking and AR/VR training applications. If you need higher performance or reliability, you can use the Nokia MX Boost solution to combine the strengths of multiple radio technologies.

Mission-critical Industrial Edge and application catalog

Nokia MX Industrial Edge (MXIE) is an on-premises edge solution designed to accelerate the digital transformation of your operational technology (OT). It processes your data locally so you can maintain security and support high-bandwidth applications such as video surveillance.

Our ecosystem-neutral edge application catalog makes it easy to use MXIE to deploy applications such as Network Digital Twin and High Accuracy Indoor Positioning. These applications can help you create a flexible, data-driven production line that takes efficiency and safety to new heights while minimizing downtime.

Industrial devices

Ruggedized Nokia Industrial Devices enrich connectivity at any factory or warehouse. 4G and 5G handhelds improve worker safety and efficiency by enabling applications such as push-to-talk, push-to-video, barcode scanning and remote maintenance support tools. Accessories from Savox give workers more user-friendly ways to connect, even in harsh or noisy environments. Field routers and dongles ease maintenance and automation by connecting production equipment, AMRs and other assets.

Benefits – Manufacturing and logistics

Why choose One Digital Platform for your Industry 4.0 journey?

Support continuous operations

Minimize downtime with a robust communications network that supports remote maintenance and keeps your business- and mission-critical systems up and running.

Optimize performance, productivity and cost

Speed processes, lower OPEX and improve visibility and quality with high-performance network, edge and device solutions that support applications such as digital twins, real-time video analytics and collaborative robots.

Connect everyone and everything

Meet the needs of connected workers, devices, machines, AMRs and vehicles with scalable and flexible solutions that deliver consistently high data rates and low latency.

Improve worker safety and efficiency

Avoid accidents and get the best from every worker with ruggedized handhelds and group communications applications that improve situational awareness and safety.

Protect your data and intellectual property

Keep hackers and cyber criminals out with cellular technology that features built-in encryption and authentication (zero trust network access), and an edge computing plat-form that keeps your data on your premises.

Support effortless mobility

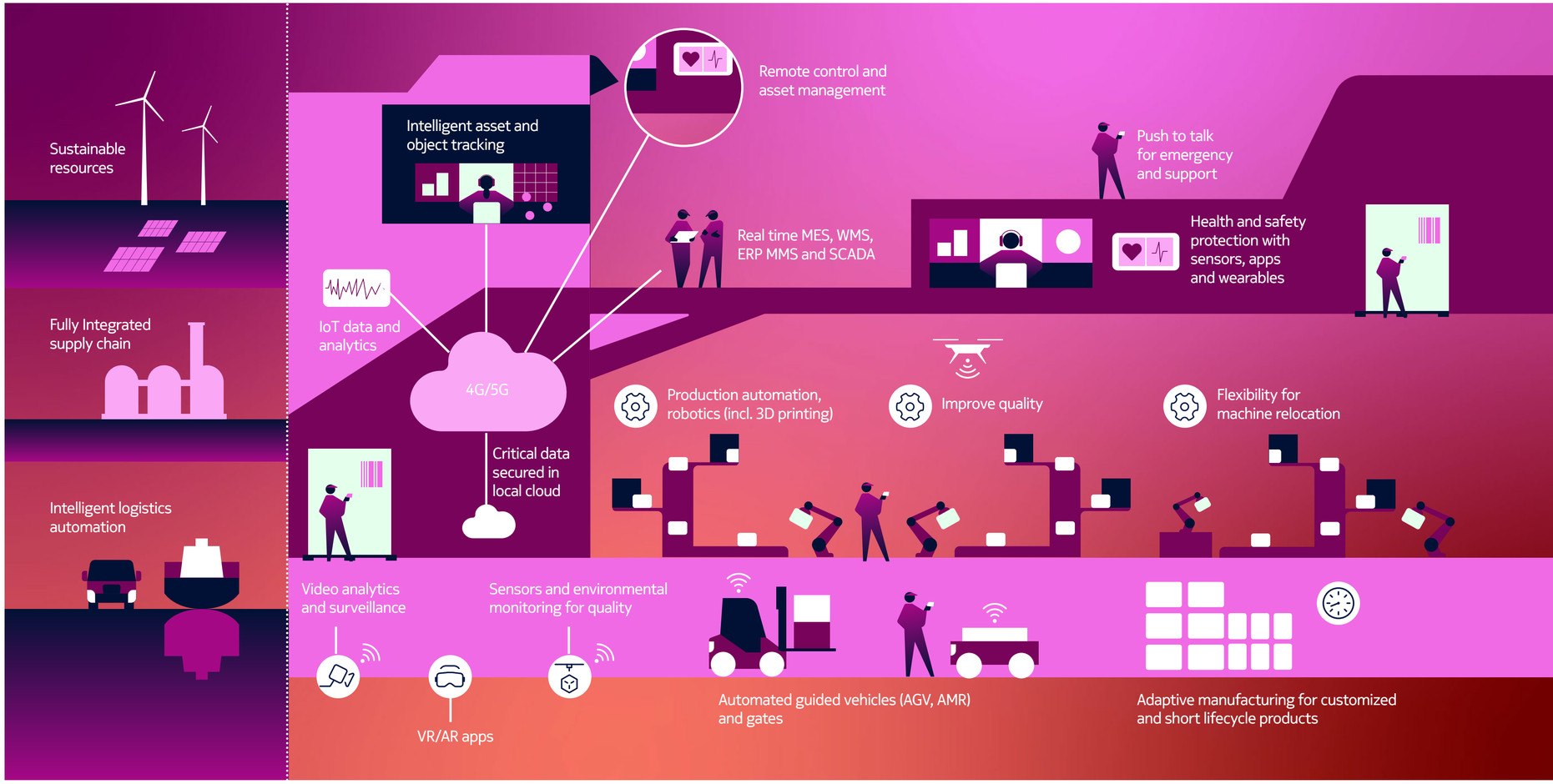
Untether your operations with pervasive and secure wireless connectivity that supports advanced applications on mobile assets such as AMRs.

Increase operational control and agility

Use the flexibility and scalability of 4.9G/LTE and 5G to retool your processes as demands change or optimize network performance for specific applications.

Use case – Manufacturing and logistics

See how our digital platform can transform factories and warehouses



Case studies – Manufacturing and logistics

Inspecting airplane engines virtually, with help from 5G

Maintenance, repair, and overhaul (MRO) companies play a critical role in maintaining aircraft safety and flightworthiness. Their work requires constant, often face-to-face, collaboration between engineers on the shop floor and the aircraft owners they serve.

In the early days of the COVID-19 pandemic, lockdowns and travel restrictions made it difficult for Lufthansa Technik, one of the leading providers of aircraft MRO services, to perform in-person inspections of aircraft engines with its customers. Nokia helped Lufthansa Technik address this challenge by deploying a 5G private wireless network that enabled the company to conduct remote inspections from its facility in Hamburg, Germany.

These “virtual table inspections” use 4K wireless cameras and a hyper-fast video link to enable civil aviation customers to observe and approve work on aircraft engines without traveling to Hamburg. This saves time and money and improves operational efficiency on the shop floor. High-resolution video generates significant volumes of data, and requires the high bandwidth and super-low latency that only cellular technology can provide.

Although intended as a proof of concept, the virtual table inspection capability quickly proved its mission-critical value. After a yearlong trial, Lufthansa Technik confirmed that it would move to a permanent Nokia 5G Standalone private wireless network deployment. The company will also use the new network to support additional Industry 4.0 use cases.

Case studies – Manufacturing and logistics

Future-proofing manufacturing facilities for success

Leading consumer durables and electronics manufacturer Arçelik Global is deploying Turkey's first commercial private 4.9G/LTE network in partnership with Nokia and Türk Telekom. This 5G-ready network will provide pervasive, reliable, low-latency connectivity for the company's washing machine manufacturing facility in the Çayırova district of Kocaeli Province.

Nokia will provide Arçelik with industrial-grade private wireless infrastructure based on Nokia DAC. This digitalization platform provides reliable high-bandwidth, low-latency private networking. It also incorporates on-premises edge computing capabilities, voice and video services, and a catalog of digital applications and enablers.

Arçelik plans to use the new infrastructure to accelerate its digital transformation and implement Industry 4.0 use cases. For example, the company will take advantage of industrial-grade connectivity to enhance AGV performance, support high-accuracy indoor provisioning for real-time asset tracking, and improve safety and security with video analytics applications.

Nokia and Arçelik aim to collaborate on other use cases, including augmented and virtual reality, digital twins, inventory control, safety and facility management, quality control, high-resolution video for remote inspections, and facility-wide voice and video communication. This collaboration will allow Arçelik to advance its leadership in manufacturing digitalization.

Manufacturing and logistics

Let us help you make Industry 4.0 a reality

We're ready to help you accelerate your Industry 4.0 initiatives and support use cases that make your production operations more agile, efficient and profitable.

Want to learn more about what one digital platform could do for your factories, warehouses or supply chains?

Visit our website or talk to one of our experts

Energy and natural resources

Energy and natural resources companies must digitalize and automate their operations to survive and thrive.

To succeed, they need networks, devices and applications that can provide robust and reliable wireless connectivity for everything from mobile workers and substations to offshore platforms and wind turbines.

Opportunity and market fact – Energy and natural resources

Energy companies need flexible and reliable connectivity

Change is coming fast for the energy and resources industry. And while power utilities, wind farm operators and oil and gas companies face different operational challenges, they share many of the same big goals: Keep pace with shifting demand. Develop new business models. Reduce carbon emissions. Improve safety, security and productivity across the supply chain.

Industry 4.0 technologies such as IIoT, machine learning and augmented reality can help your company use data-driven automation to achieve these goals and more. But you can't take full advantage of these technologies by relying on Wi-Fi and legacy application-specific networks such as advanced metering infrastructure (AMI), two-way radio (TETRA, P25) and supervisory control and data acquisition (SCADA).

To digitalize and automate your operations, you need a flexible platform that can:

- Meet the high performance, reliability and security requirements of your mission-critical operational technology (OT)
- Support high-bandwidth edge computing applications while protecting your industrial data
- Provide robust connectivity for all industrial devices, video cameras, IoT sensors, machines and vehicles
- Transform data into operational insight and support autonomous actions
- Ease your digital transformation and avoid disrupting your operations

This platform must be easy to deploy, operate and integrate with your existing networks and assets. It also has to work seamlessly with the Wi-Fi networks you rely on for basic IT connectivity.

Projected CAGR in digitalization investments by the oil and gas industry between 2021 and 2030:

6% [5]

Projected spending on IoT devices by the oil and gas industry in 2030:

US$4.8 billion [6]

Forecasted spending on connectivity by the oil and gas industry in 2030:

US$2 billion [7]

Projected spending by oil and gas firms on digitalization in 2030:

US$15 billion [8]

Forecasted CAGR in security investments by the oil and gas industry between 2021 and 2030:

8.1% [9]

Percentage of data collected by power utilities that is used to inform decision making:

20–30% [10]

Number of unique types of data that one power plant collected over ten years that went unnoticed by its leadership team:

30,000 [11]

Percentage of utilities that will increase spend in automating operations with an emphasis on edge, AI and ML technologies by 2025:

>50% [12]

Solution – Energy and natural resources

Empowering the energy and resources industry for the digital era

Nokia helps energy and resources companies accelerate their digital transformation with one digital platform that includes mission-critical Private Wireless, Wi-Fi, Industrial Edge, devices and applications.

This unified platform enables people and machines to work together in a safe, efficient and sustainable way.

Industrial-grade connectivity

Our private 4.9G/LTE and 5G solutions deliver pervasive, flexible connectivity that makes it easy to support new applications and business models and adapt to changing energy demands. They let you combine low latency with high performance, resiliency and security to meet the connectivity requirements of any use case – even in harsh, interference-prone or remote environments.

Nokia Digital Automation Cloud (DAC) Wi-Fi lets you use Wi-Fi 6/6E to provide connectivity for IT and non-business-critical OT applications such as AR-based work instruction solutions. If you need higher performance or reliability, you can use the Nokia MX Boost solution to combine the strengths of multiple radio technologies.

Mission-critical Industrial Edge and application catalog

Nokia MX Industrial Edge (MXIE) is an on-premises edge solution designed to accelerate the digital transformation of your operational technology (OT). It processes your data locally so you can maintain security and support high-bandwidth applications such as video surveillance.

Our ecosystem-neutral edge application catalog makes it easy to use MXIE to deploy capabilities such as automated operations, connected drones, predictive maintenance and digital twins. These capabilities can help you support flexible, data-driven production processes that take efficiency and safety to new heights while minimizing downtime.

Industrial devices

Ruggedized Nokia Industrial devices enhance connectivity at any industrial site. 4G and 5G handhelds allow mobile workers to use push-to-talk and push-to-video applications to stay connected and informed.

Smart personal protective equipment (PPE), environmental sensors and video monitoring help workers stay safe and avoid hazards.

Benefits – Energy and natural resources

Why choose One Digital Platform for your Industry 4.0 journey?

Reduce the impact of shutdowns, turnarounds and outages

Minimize downtime with a robust communications network that lets you use collaboration, predictive analytics and remote maintenance to keep your business-critical systems up and running.

Optimize performance, productivity and cost

Speed up processes, lower OPEX and get lthe most from your assets with high-performance network, edge and device solutions that support applications such as digital twins and AR-based work instructions.

Improve worker safety and efficiency

Avoid accidents and get the best from mobile workers with smart PPE and ruggedized handheld devices that support rich push-to-talk and push-to-video services and features such as panic buttons.

Secure your operations

Shield your assets, data and processes from hackers with cellular technology that features built-in encryption and authentication (zero trust network) and an edge computing platform that keeps your data on your premises.

Ensure pervasive coverage

Increase efficiency and support new energy applications by extending ubiquitous wireless connectivity across large and challenging environments such as field area networks, oil fields and offshore wind farms.

Connect everyone and everything

Meet the needs of connected workers, machines, drones, robots, vessels and vehicles with scalable solutions that deliver consistently high data rates and low latency.

Make mobility effortless

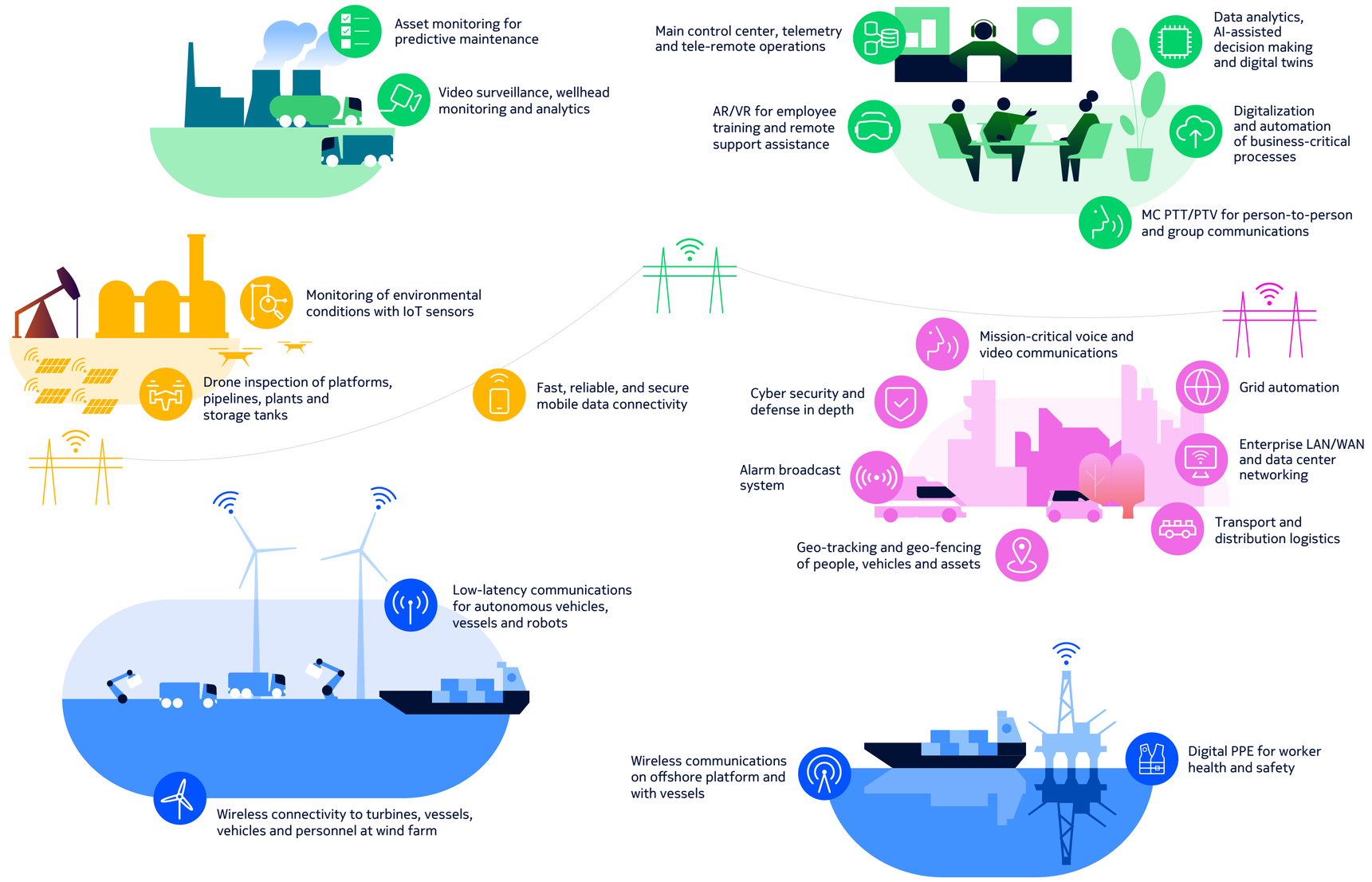
Enhance your operations with connectivity that supports advanced applications on mobile assets such as robots and drones.

Increase operational control and agility

Use the flexibility and scalability of 4.9G/LTE or 5G to adapt your operations to shifting energy demands and optimize network performance for specific applications.

Use case – Energy and natural resources

See how one platform can transform the energy and resources value chain



Case study – Energy and natural resources

Private 4.9G/LTE network transforms offshore wind farm operations

Wind farm operators are increasing their use of digitalization and automation to keep pace with growing demand for offshore wind power. These capabilities require wireless communication systems that can reliably deliver high speeds and low latency and transfer large amounts of data over long distances.

Operators across the Belgian North Sea are addressing this need by using our private 4.9G/LTE networks to provide secure broadband connectivity for their workers, vessels, sensors and operation centers. The deployed networks make it easier to operate larger turbines in more remote areas where wind speeds are greater.

The private LTE solution uses wireless base stations installed on substations within the wind farm and connects them to the shore with fiber laid on the seabed. Vessels are equipped with LTE equipment. The deployment enables a host of digital applications, including push-to-talk and push-to-video communication, drone-based inspections, predictive maintenance, AR/VR remote assistance, high-volume data transfer and leisure connectivity for remote crews.

Thanks to these 5G-ready private wireless networks, the entire Belgian North Sea has secure, reliable broadband coverage that will enable operators to use digitalization and Industry 4.0 technologies to construct and maintain turbines in a more efficient and cost-effective way.

Read the full case study to find out more about how our solutions help wind farms keep their assets connected

Energy and natural resources

Let us help you make Industry 4.0 a reality

We're ready to help you use the power of Industry 4.0 to stay ahead of shifting energy demand and ensure safe, efficient and sustainable operations.

Want to learn more about what one digital platform could do for your business?

Visit our website or talk to one of our experts

Transportation

Airports, port terminals and urban rail operators are embracing digitalization and Industry 4.0 to keep pace with constantly changing travel and shipping demands. To succeed, they need solutions that can meet the connectivity and data requirements of vehicles, machines and people in challenging and interference-prone environments.

Opportunity and market fact – Transportation

Modern transportation hubs run on wireless connectivity

The transportation industry relies on vast quantities of data to keep traffic flowing through busy and complex sites and ensure smooth journeys for passengers and freight. In airports, seaports and rail yards, more and more operational processes are being digitalized to support critical goals such as achieving operational excellence, improving safety and security, enhancing the passenger experience and reducing carbon emissions. But many transportation enterprises use a mix of siloed wireless technologies to support their operations. These technologies can be inflexible and may have coverage, interference or quality of service limitations that make it difficult to realize the benefits of digitalization.

To get the most from digitalization and Industry 4.0, you need a platform that can:

- Provide reliable, scalable and secure connectivity for a diverse mix of devices, systems, machines and stakeholders in any environment
- Support high-bandwidth edge computing applications while protecting your industrial data
- Meet the high performance, reliability and security requirements of your mission-critical operational technology (OT)
- Transform data into operational insight and support autonomous actions
- Ease your digital transformation and avoid disrupting your operations

This platform must be easy to deploy, operate and integrate with your existing networks and assets. It also has to work seamlessly with the Wi-Fi networks you rely on for basic IT connectivity.

Forecasted number of air travelers worldwide in 2024:

4 billion[13]

Projected CAGR in container growth trade between 2022 and 2030:

2.9%[14]

Portion of the world's merchandise trade carried by maritime transport:

90%[15]

Percentage by which cyberattacks on the maritime industry increased between February and May 2020:

400%[16]

Increase in unauthorized intrusion attempts at the Port of Los Angeles since the beginning of the COVID-19 pandemic:

50%[17]

Solution – Transportation

Networks designed for transportation at the speed of life

Nokia helps airports, port terminal operators and urban railways accelerate their Industry 4.0 transformation with one digital platform that includes mission-critical Private Wireless, Wi-Fi, Industrial Edge, devices and applications.

This unified platform enables people, machines and vehicles to work together in a safe, efficient and sustainable way.

Industrial-grade connectivity

Our private 4.9G/LTE and 5G networks deliver pervasive indoor and outdoor connectivity that helps you digitalize and control your operations. They provide the low latency, high performance, resiliency and security you need to support critical communications and provide fully connected experiences to passengers.

Nokia Digital Automation Cloud (DAC) Wi-Fi lets you use Wi-Fi 6/6E to support IT and non-business-critical OT use cases such as passenger connectivity and AR-based workflow and asset tracking applications. If you need higher performance or reliability, you can use the Nokia MX Boost solution to combine the strengths of multiple radio technologies.

Mission-critical Industrial Edge and application catalog

Nokia MX Industrial Edge (MXIE) is an on-premises edge solution designed to accelerate the digital transformation of your OT. It processes your data locally so you can maintain security and support data-intensive applications such remote vehicle control, autonomous cargo handling equipment and predictive maintenance.

Our ecosystem-neutral edge application catalog makes it easy to use MXIE to deploy capabilities such as connected drones, digital twins and real-time video surveillance enabled by machine learning analytics. These capabilities can help you support flexible, data-driven operations that take efficiency, safety and situational awareness to new heights.

Industrial devices

Ruggedized Nokia Industrial Devices can enhance connectivity at any site. Certified 4G and 5G handhelds, wearables and accessories support rich voice, video and remote monitoring applications that improve worker safety and productivity.

Hardened indoor and outdoor field routers connect everything from cranes and gates to cameras and vehicles to automate processes and speed up turnaround times.

Benefits – Transportation

Why choose One Digital Platform for your Industry 4.0 journey?

Accelerate your Industry 4.0 transformation

Connect and control your digital airport or harbor with a dedicated, reliable and secure Private Wireless network and an Industrial Edge designed for OT use cases.

Reduce turnaround time

Provide reliable wireless connectivity and real-time insights to crews, systems and devices.

Greater operational control

Enhance safety and respond to changing operational demands and emergencies more effectively by ensuring that cameras, vehicles, first responders and strategic locations always have reliable connectivity.

Improve the passenger experience

Give passengers better connectivity and smoother travel experiences.

Avoid disruptions and downtime

Deploy a robust and reliable communications network that keeps your business- and mission-critical systems up and running.

Protect your operations

Keep hackers out with cellular technology that features built-in encryption and authentication and an edge computing platform that keeps your data on your premises.

Ensure pervasive coverage

Increase efficiency and support new applications by extending ubiquitous wireless connectivity across large and challenging environments such as container terminals, airports and urban rail scenarios.

Make mobility effortless

Untether your operations with wireless connectivity that supports advanced applications on mobile assets such as robots, cranes and drones.

Connect everyone and everything

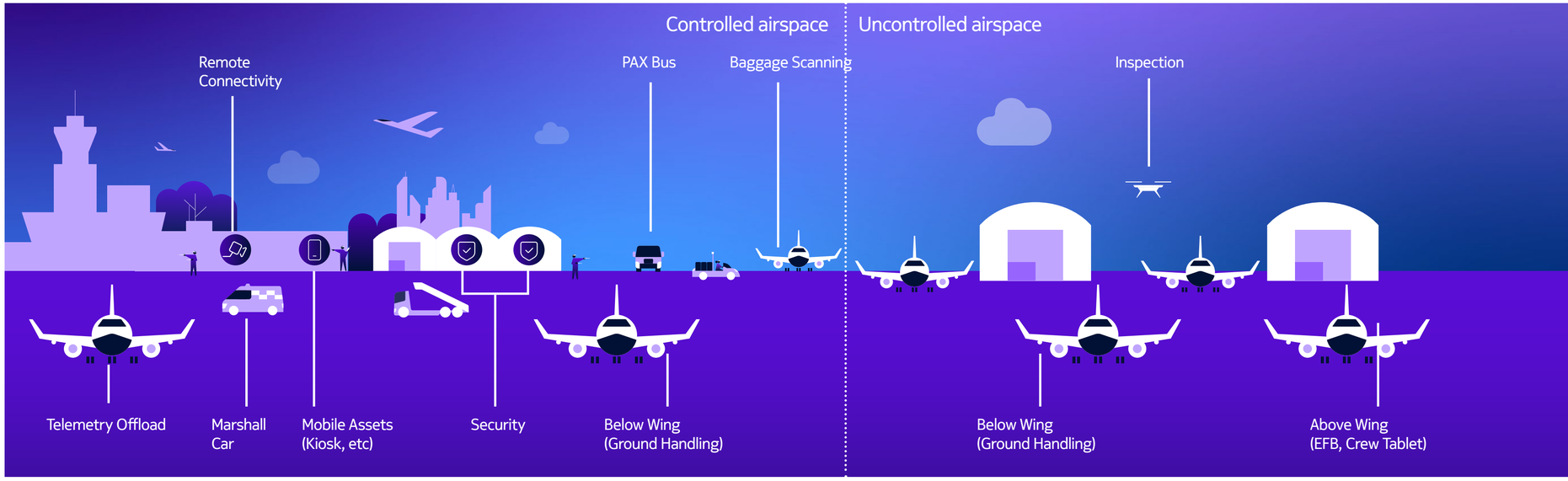
Meet the connectivity needs of connected workers, devices, machines, robots, vessels and vehicles with consistently high data rates and low latency.

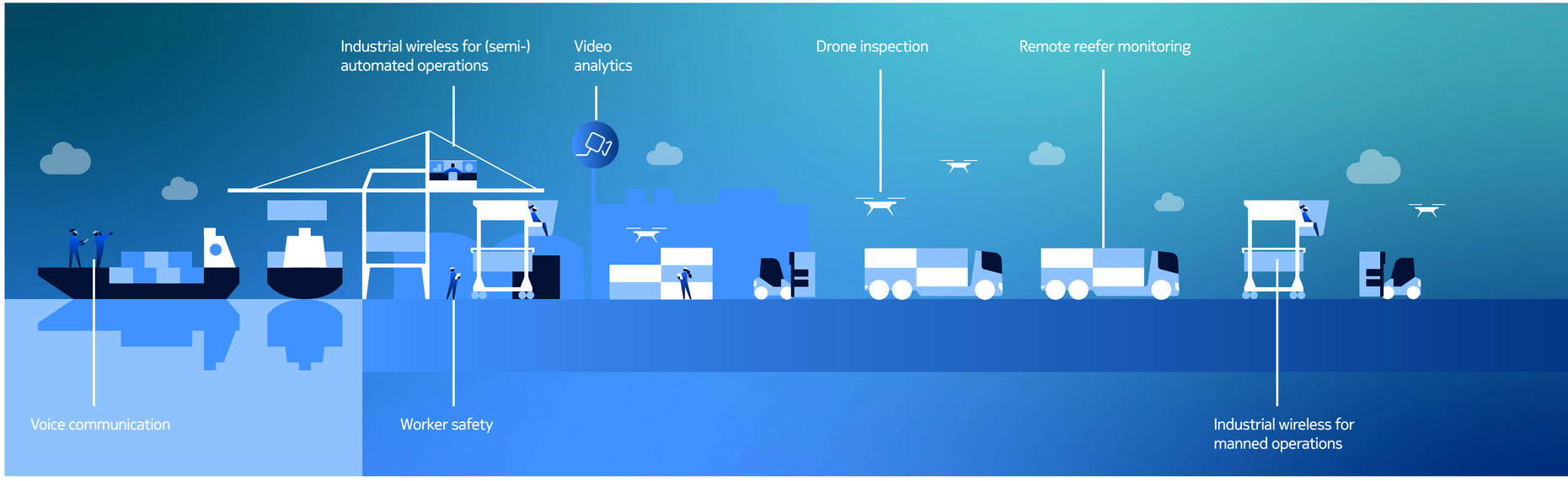
Improve worker safety and productivity

Keep your workforce safe with connected devices and technologies that enable real-time monitoring and risk mitigation and automated alarms.

Use case – Transportation

See how our digital platform transforms transportation





Case studies – Transportation

Private 5G network fuels innovation at Brussels Airport

Brussels Airport has deployed a 5G-ready private wireless network to increase efficiency and support innovative applications. The network will help the airport optimize its operations, accelerate its digital transformation and ease the integration of future technologies.

The new network is enabled by Nokia DAC. It delivers much faster and more reliable connectivity than Wi-Fi or public LTE networks. Combining high capacity with low latency and pervasive coverage, the network makes it possible for the airport to explore technologies such as IoT, automated vehicles, mobile safety systems, and track-and-trace applications.

In the project's initial phase, the airport will use 5G technology to provide industrial-grade connectivity outdoors. A subsequent phase will bring 5G to indoor environments. The airport will take advantage of the network's capabilities to test a variety of technologies and applications to determine what value they can provide.

By deploying a 5G-ready private wireless network — one of the first in Belgium and one of the first in a European airport — Brussels Airport has confirmed its position as a pioneer in digital innovation. The network gives the airport a foundation for using Industry 4.0 automation to make air travel safer and more convenient, enhance operational awareness and support new business models.

Case studies – Transportation

Port of Zeebrugge powers logistics innovation with 5G-ready private wireless

Belgium's Port of Zeebrugge has become a leading innovator in logistics automation with help from a 5G-ready private wireless network powered by Nokia DAC.

The new network provides connectivity to more than 100 endpoints throughout the port. It supports the delivery of enhanced services that help the port improve its operational performance and speed up port transformation and digitalization.

The port is already using the network to connect tugboats, air pollution detectors, security cameras and quay sensors. It will also use take advantage of the network's high bandwidth and low latency to support the construction and maintenance of new sea locks and offshore wind farms.

Several external suppliers have also signed up to the network, which will be used by port-based companies for dispatching, connectivity with straddle carriers, track and trace systems and integrated communications.

Rick Goetinck, CEO, Port of Zeebrugge, said,

"The introduction of a 5G-ready platform at the Port of Zeebrugge brings benefits to a wide range of stakeholders across local enterprises, ancillary shipping businesses and government. The Port of Zeebrugge is an ultra-modern logistics center that serves European and intercontinental markets, and our investment in hyper fast connectivity can only improve the competitive position of our port."

Transportation

Let us help you make Industry 4.0 a reality

We're ready to help you use the power of Industry 4.0 to provide safe, efficient and sustainable transportation for passengers and cargo.

Want to learn more about what one digital platform could do for your operations?

Visit our website or talk to one of our experts

Mining

Mining operators are making significant investments in Industry 4.0 to optimize safety, sustainability and efficiency. To get full value from your digital investments, you need platforms that can bring you industrial-grade wireless connectivity, edge computing, devices and applications.

Opportunity and market fact – Mining

The network is critical for mining transformation

Mining companies are embracing automation to improve their ability to handle rapid shifts in supply and demand and comply with stringent environmental and safety regulations above and underground.

The automation of critical processes such as drilling, blasting, hauling and crushing can play a vital role in making your mines and pit-to-port operations safer, more efficient and more productive. And broadband data and video communications are essential for your increasingly mobile workforce. But extreme automation and enriched communications demand robust wireless connectivity that is beyond the capabilities of Wi-Fi, TETRA and P25-based radio networks.

To get the most from Industry 4.0, you need a platform that can:

- Provide wireless connectivity that delivers high levels of performance, reliability and security to operational technology (OT), vehicles, machines, devices and workers in open pit and underground environments, as well as from pit to port
- Support data-intensive edge computing applications while protecting your industrial data
- Transform data into operational insight and support autonomous actions
- Ease your digital transformation and avoid disrupting your operations

This platform must be easy to deploy and integrate with the systems and assets you rely on today.

Estimated value that digitalization will bring to the mining industry, customers, society and the environment between 2015 and 2025:

$425 million[18]

Tonnes of reduction in CO_2 emissions that digitalization will enable between 2015 and 2025:

610 million[19]

Decrease in injuries that digitalization will enable within the mining industry by 2025:

20%[20]

Portion of mining operations costs spent on maintaining plant, fleet and equipment:

30-50%[21]

Solution – Mining

A purpose-designed digital platform for Mining 4.0

Nokia helps mine operators accelerate their Industry 4.0 transformation with one digital platform that includes mission-critical Private Wireless, Wi-Fi, Industrial Edge, devices and applications.

This unified platform enables all of a mine's people, vehicles and machines to work together in a safe, efficient and sustainable way.

Industrial-grade connectivity

Our private 4.9G/LTE and 5G networks provide the pervasive, flexible connectivity you need to enable a new breed of smart digital applications that can optimize your mining operations. They let you combine low latency with high performance, resiliency and security to support a variety of use cases for mining exploration in challenging open-pit and underground environments.

Nokia Digital Automation Cloud (DAC) Wi-Fi lets you use Wi-Fi 6/6E to meet the connectivity demands of IT and non-business-critical OT applications such as AR-based workflow or asset-tracking solutions. If you need higher performance or reliability, you can use the Nokia MX Boost solution to combine and maximize the strengths of multiple radio technologies.

Mission-critical Industrial Edge and application catalog

Nokia MX Industrial Edge (MXIE) is an on-premises edge solution designed to accelerate the digital transformation of your OT. It processes your data locally so you can maintain security and support data-intensive applications such remote monitoring and automation, autonomous trucks and robots, and predictive maintenance enabled with IoT and analytics.

Our ecosystem-neutral edge application catalog makes it easy to use MXIE to deploy capabilities such as connected drones, digital twins, and real-time video surveillance driven by machine learning analytics. These capabilities can help you support flexible, data-driven extraction operations that take efficiency, safety and situational awareness to new heights.

Industrial devices

Ruggedized Nokia Industrial Devices help you improve communications and automation at any mining site. Hardened outdoor field routers can facilitate Autonomous Haulage Systems or provide network connectivity to leak detection sensor systems at tailings dams.

Certified and ruggedized handhelds, industrial accessories and wearables can support right voice, video and monitoring applications that keep mobile workers connected, safe and informed.

Benefits – Mining

Why choose One Digital Platform for your Industry 4.0 journey?

Streamline maintenance and avoid outages

Minimize downtime with a high-performance communications network that can support IoT-driven predictive maintenance applications and keep your critical systems up and running.

Support 24/7 operations

Provide robust connectivity and Industrial Edge computing that enable workers to monitor automated processes and operate virtual telepresence robots from the control center.

Ensure pervasive coverage

Increase efficiency and support new applications in all parts of the mine by extending ubiquitous wireless connectivity across open-pit and underground environments.

Connect everyone and everything

Meet the connectivity needs of workers, devices, machines, drones, robots and vehicles with one platform that delivers consistently high data rates and low latency.

Make mobility effortless

Mobilize your mining operations with wireless connectivity and edge computing that support advanced applications and automation for moving assets such as diggers, haulers, crushers, trains and drones.

Increase operational control and agility

Use the flexibility and scalability of 4.9G/LTE and 5G to adapt your mining operations to shifting demands or optimize network performance for specific applications.

Strengthen your cyber defense

Shield your mining assets, data and processes from hackers with cellular technology that features built-in encryption and authentication and an Industrial Edge that keeps your data on your premises.

Enhance mission-critical communications

Keep workers safe and connected with ruggedized devices that support advanced push-to-talk and push-to-video services and features such as a panic button.

Improve situational awareness and worker safety

Improve safety, sustainability and security with connectivity that supports smart PPE, environmental sensors, video monitoring and geo-fencing services.

Embrace automated and autonomous operations

Benefit from our partnerships with leading equipment manufacturers such as Komatsu and Sandvik to enable end-to-end applications for automation, autonomous vehicles and IIoT over LTE and 5G networks.

Use case – Mining

See how one platform can transform your mine operations

Operational-critical comms

- PTT/PTV
- Remote/autonomous ops
- Critical M2M/IoT

Situational awareness

- People, trucks & equipment
- Sensor network
- CCTV cameras
- Drones

Safety & sustainability

- People, trucks & machines
- Geo-fencing
- Health & fatigue
- Slopes, air, water, weather

Efficiency through automation

- ADS & AHS
- Remote control & collaboration
- Asset maintenance & optimization

Case study – Mining

Boliden Kevitsa: A connected digital mine

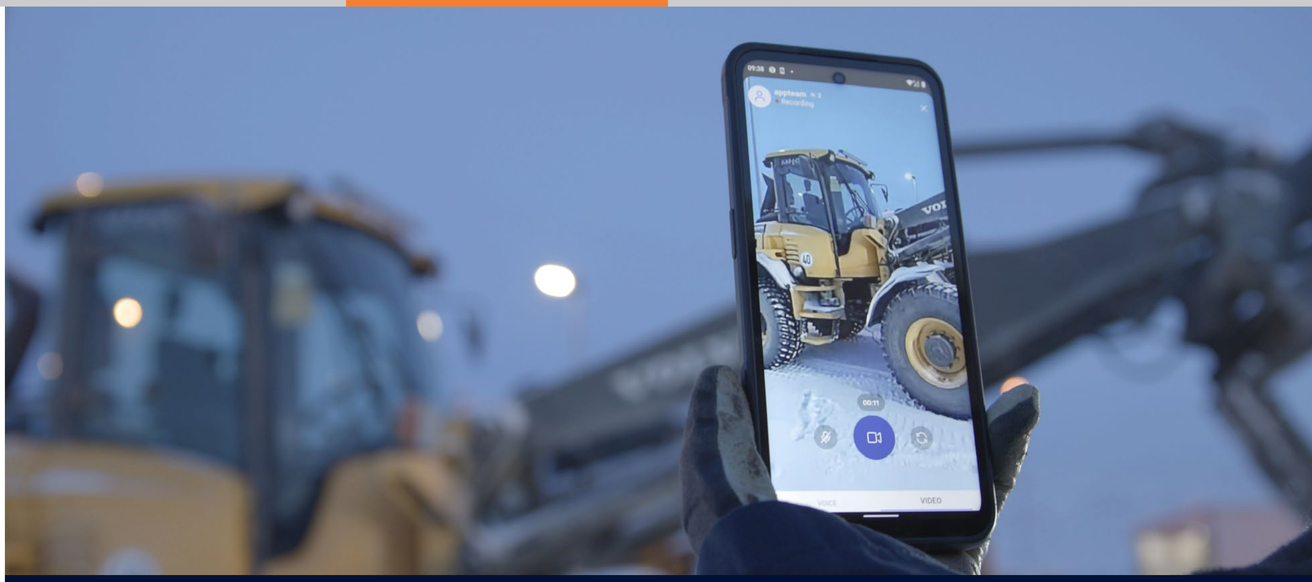
Boliden strives to be the most climate-friendly and respected metal supplier in the world. At the Boliden Kevitsa multi-metal open pit mine in Northern Finland, the company is working to improve productivity and safety and reduce its environmental impact by investing in automation, electrification and remote control.

A purpose-designed private 4.9G/LTE network is the main enabler of automation at the mine. Designed, built and operated by Edzcom using Nokia Industrial-grade Private Wireless technology, the network uses four access points to provide mission-critical connectivity to the entire 14 km2 pit area. It also provides seamlessly integrated coverage for all the buildings and facilities at the site, along with full connectivity for every employee.

Boliden uses the network to enable several advanced Industry 4.0 use cases. These include tele-remote drilling, software that ensures that haul trucks dump their contents in the right places, and monitoring to enable preventative vehicle maintenance. The network also supports a host of other business-critical applications, including group communications, IoT analytics and low-latency edge computing for remote, automated and autonomous applications.

According to **Henrik Grind, general manager at Boliden Kevitsa**.
"The private wireless project has significantly helped us in our goals to become a better mine."

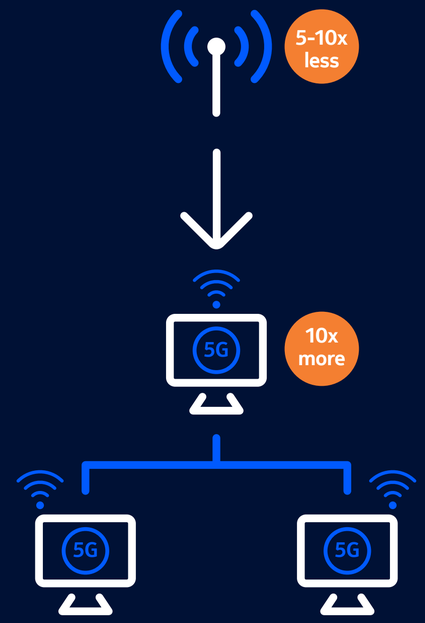
Visit our website to try our private wireless TCO calculator



How much could your mine save with private wireless?

The digital transformation of mines requires mission-critical wireless connectivity. Private wireless networks based on 4.9G/LTE and 5G are the only networks that can meet the connectivity demands of machines, systems and workers throughout the mine. They require 5–10 times fewer antennas and can support nearly 10 times more active connections than comparable Wi-Fi networks.

On the OPEX side, private wireless reduces configuration, management and maintenance cost by a factor of four compared to Wi-Fi, which translates to nearly five times lower total cost of ownership (TCO).



Mining

Let us help you make Industry 4.0 a reality

We're ready to help you unleash the power of Industry 4.0 to improve mine safety, sustainability, productivity and efficiency.

Want to learn more about what one digital platform could do for your mine operations?

Visit our website or talk to one of our experts

One platform for industrial digitalization

Discover our unified platform for Industry 4.0

Today, 70 percent of industrial assets, machines and field workers are unconnected, which means they don't provide real-time data that can be used for operational insights. What's more, IT and operational technologies (OT) are often incompatible because of complex protocols, certifications and skills gaps. All of this makes it more challenging for enterprises to embrace Industry 4.0 and adopt new applications and devices.

To succeed with digital transformation, you need the ability to capture and act on data, often in near-real time. Data from IIoT sensors must be processed by edge computing systems that can use artificial intelligence (AI) and machine learning (ML) to model and analyze it. The results must then used to make split-second decisions, reconfigure processes and achieve new efficiencies, especially around automation.

We can help you address these challenges by providing you with one unified digital platform that includes Private Wireless connectivity, an Industrial Edge, digital applications and Industrial Devices.

As enterprise needs vary, therefore we have two main versions of our industrial-grade private wireless solution:

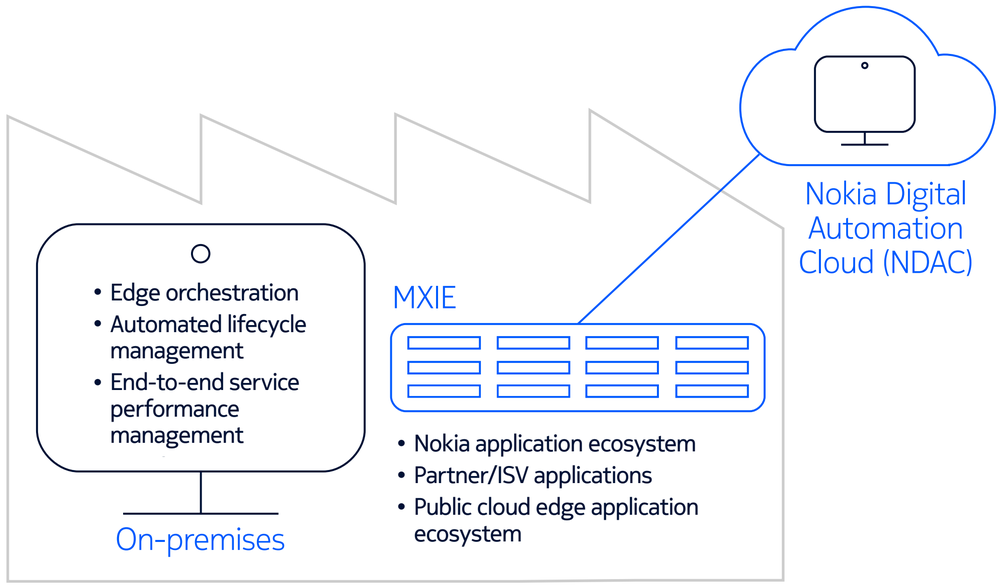
1. The Nokia Digital Automation Cloud (DAC) provides an integrated plug-and-play private wireless service solution and a digital automation platform with ready-to-run applications.
2. Our Modular Private Wireless (MPW) solution offers all the elements needed to create a bespoke private wireless solution that is either completely autonomous or in a variety of hybrid configurations with third-party providers such as mobile operators.

One platform for industrial digitalization by Nokia

One platform for industrial digitalization

Nokia MX Industrial Edge

Nokia MX Industrial Edge (MXIE) is an on-premises edge solution that combines a simple as-a-service model with a high-performance, resilient and secure edge architecture. Designed to accelerate OT transformation, MXIE comes with a portfolio of ready-to-use industrial applications and connectors and supports an extensive range of industrial devices.



One platform for industrial digitalization

Click-to-deploy industrial applications

Nokia industrial applications are designed to cut through complexity and accelerate your digital transformation. All of them support one-click deployment on MXIE. Our growing catalog of applications and connectors includes:

- High Accuracy Indoor Positioning for real-time location tracking
- Nokia Scene Analytics for advanced insights based on real-time video and IoT streams
- Nokia Drone Networks for aerial insights from connected UAVs
- Nokia Team Comms for one-to-one or one-to-many communications
- Secure push-to-talk and push-to-video services for mobile workers
- Nokia Network Digital Twin for more efficient and productive factories

We also offer access to third-party applications such as Taqtile Manifest®, an AR-based work instruction solution, and Edge Video Orchestrator by Smart Mobile Labs, which enables high-quality many-to-many distribution of video streams.

Learn more about our application catalog

One platform for industrial digitalization

Nokia Industrial Devices

Choosing the right user equipment is as important to your Industry 4.0 strategy as choosing the right private wireless technology. Ruggedized 4G and 5G devices can play a big part in delivering business-critical communications for teams and machines in challenging industrial environments.

The Nokia Industrial device portfolio unleashes the power of private wireless for any use case or industry. It includes ruggedized equipment such as compact handhelds, workpads, field routers, dongles, hotspots and 5G video cameras. We also offer headsets, light earpieces, push-to-talk (PTT) microphones and wearable cameras.

All of our devices are pre-tested for industrial use and come with smart management tools and communication applications designed for our Industrial-grade Private Wireless solutions. Our fully integrated approach helps you boost productivity by ensuring that your workers and machines can always share information in a fast and simple way.

Nokia Industrial Devices give you:

- Seamless onboarding, simple mobile device management and plug-and-play operation
- Integrated Nokia or third-party applications
- Full integration with Nokia Digital Automation Cloud (DAC) and Modular Private Wireless solutions
- State-of-the-art handhelds designed for heavy usage (IP68 and ATEX rating)
- Ruggedized workpads with anti-vibration designs that make them ideal workmates in tough industrial environments (IP67 and IP68 rating)
- Standard dongles, indoor routers, outdoor routers with Fixed Wireless Access, and hotspots that ensure reliable connectivity for legacy technology

Learn more about Nokia Industrial user equipment

One platform for industrial digitalization

Let us help you make Industry 4.0 a reality

We're ready to help you accelerate your Industry 4.0 initiatives and support your operations to become more agile, efficient and profitable.

Want to learn more about what one digital platform could do for your factories, warehouses or supply chains?

Visit our website or talk to one of our experts

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At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering the future where networks meet cloud to realize the full potential of digital in every industry.

Through networks that sense, think and act, we work with our customers and partners to create the digital services and applications of the future.

Nokia OYJ
Karakaari 7
02610 Espoo
Finland

Tel. +358 (0) 10 44 88 000

CID 212749

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